

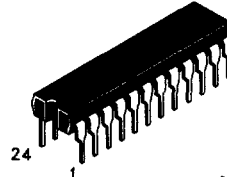
Available Q4, 1995

Octal Transceiver/Register with 3-State Outputs

This device is a high speed registered, bus transceiver circuit with outputs D-flip flops and control circuitry providing multiplexed transmission from the buses or from the internal registers. The 'AC/ACT 651 has inverted outputs. The 'AC/ACT 652 has normal outputs.

- Advanced very high speed CMOS
- Outputs source/sink 24 mA
- Transmission line driving 50 ohms
- ACT has TTL compatible inputs
- Operation from 2 to 6 volts guaranteed
- DC & AC Parameters guaranteed over -40 to +85°C

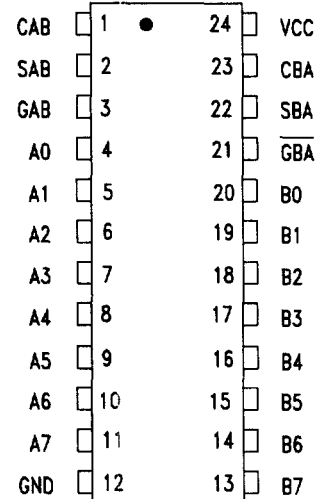
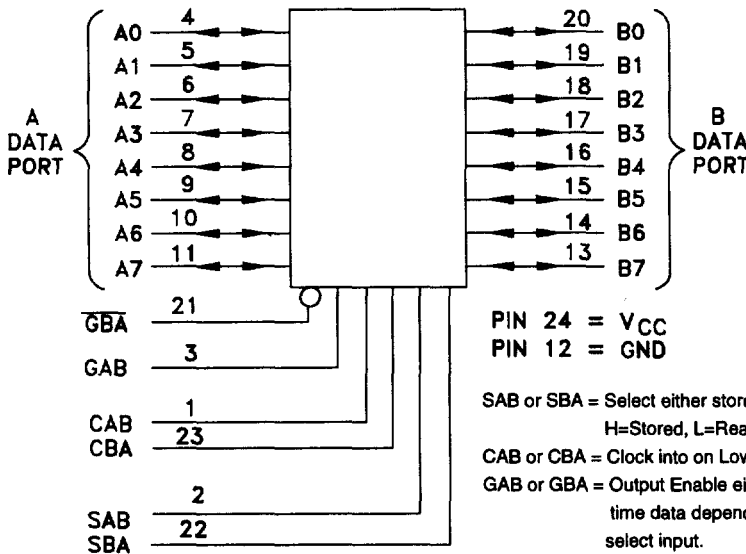
**DV74AC651, DV74AC652
DV74ACT651, DV74ACT652**



N Suffix
Plastic DIP
AVG-011 Case



DW Suffix
Plastic SOP
AVG-012 Case



SAB or SBA = Select either stored or real time data - H=Stored, L=Real Time
 CAB or CBA = Clock into on Low to High transition
 GAB or GBA = Output Enable either stored or real time data depending on status of select input.

AC651 - Inverting Outputs
 ACT652 - Noninverting Outputs

TRUTH TABLE

| Inputs | | | | | | Data I/O | | Operation or Function |
|--------|-----|--------|--------|-----|-----|--------------|--------------|---|
| GAB | GBA | CAB | CBA | SAB | SBA | A0-A7 | B0-B7 | |
| L | H | H or L | H or L | X | X | Input | Input | Isolation |
| L | H | ↑ | ↑ | X | X | Input | Input | Store A and B Data |
| X | H | ↑ | H or L | X | X | Input | Unspecified* | Store A, Hold B |
| H | H | ↑ | ↑ | X** | X | Input | Output | Store A in Both Registers |
| L | X | H or L | ↑ | X | X | Unspecified* | Input | Hold A, Store B |
| L | L | ↑ | ↑ | X | X** | Output | Input | Store B in Both Registers |
| L | L | X | X | X | L | Output | Input | Real-Time B Data to A Bus |
| L | L | X | H or L | X | H | Output | Input | Stored B Data to A Bus |
| H | H | X | X | L | X | Input | Output | Real-Time A Data to B Bus |
| H | H | H or L | X | H | X | Input | Output | Stored A Data to B Bus |
| H | L | H or L | H or L | H | H | Output | Output | Stored A Data to B Bus and Stored B Data to A Bus |

H=HIGH Voltage Level L=LOW Voltage Level X=Don't Care ↑=LOW-to-HIGH Transition
 * The data output functions may be enabled or disabled by various signals at the GBA and GAB inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every LOW-to-HIGH transition of the appropriate clock inputs.
 ** Select control=L:Clocks can occur simultaneously

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ABSOLUTE MAXIMUM RATINGS

Maximum ratings are those values beyond which damage to the device may occur.

| Symbol | Parameter | Value | Unit |
|------------------|--|-------------------------------|------|
| V _{CC} | DC Supply Voltage (Referenced to GND) | - 0.5 to +7.0 | V |
| V _{IN} | DC Input Voltage (Referenced to GND) | - 0.5 to V _{CC} +0.5 | V |
| V _{OUT} | DC Output Voltage (Referenced to GND) | - 0.5 to V _{CC} +0.5 | V |
| I _{IN} | DC Input Current, per Pin | ± 20 | mA |
| I _{OUT} | DC Output Sink/Source Current, per Pin | ± 50 | mA |
| I _{CC} | DC V _{CC} or GND Current per Output Pin | ± 50 | mA |

GUARANTEED OPERATING CONDITIONS over full range

| Symbol | Parameter | Min | Typ | Max | Unit | |
|------------------------------------|--|-------------------------|-----|-----------------|------|------|
| V _{CC} | Supply Voltage | 'AC | 2.0 | 5.0 | 6.0 | V |
| | | 'ACT | 4.5 | 5.0 | 5.5 | |
| V _{IN} , V _{OUT} | DC Input Voltage, Output Voltage, (Ref. to GND) | 0 | | V _{CC} | V | |
| t _r , t _f | Input Rise and Fall Time (V _{IN} from 30% to 70% V _{CC}) 'AC Devices except Schmitt Inputs | V _{CC} @ 3.0 V | | | 150 | ns/V |
| | | V _{CC} @ 4.5 V | | | 40 | ns/V |
| | | V _{CC} @ 5.5 V | | | 25 | ns/V |
| t _r , t _f | Input Rise and Fall Time (V _{IN} from 0.8 to 2.0 V) 'ACT Devices except Schmitt Inputs | V _{CC} @ 4.5 V | | | 10 | ns/V |
| | | V _{CC} @ 5.5 V | | | 8.0 | ns/V |
| C _{IN} | Input Capacitance | | 4.5 | | pF | |
| CPD | Power Dissipation Capacitance | | 45 | | pF | |

1. V_{IN} from 30% to 70% V_{CC}

2. V_{IN} from 0.8 to 2.0 V

AC — 651, 652

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | V _{CC} (V) | AC651, AC 652 | | | Unit | |
|-----------------|--------------------------------------|---|------------------------|------------------------|-------------------|----------------------------------|------|---|
| | | | | T _A = +25°C | | T _A = -40 to +85°C | | |
| | | | | Typ | Guaranteed Limits | | | |
| V _{IH} | Minimum High Level Input Voltage | V _{OUT} = 0.1V or V _{CC} - 0.1 V | 3.0 | 1.5 | 2.1 | 2.1 | V | |
| | | | 4.5 | 2.25 | 3.15 | 3.15 | | |
| | | | 5.5 | 2.75 | 3.85 | 3.85 | | |
| V _{IL} | Maximum Low Level Input Voltage | V _{OUT} = 0.1V or V _{CC} - 0.1 V | 3.0 | 1.5 | 0.9 | 0.9 | V | |
| | | | 4.5 | 2.25 | 1.35 | 1.35 | | |
| | | | 5.5 | 2.75 | 1.65 | 1.65 | | |
| V _{OH} | Minimum High Level Output Voltage | I _{OUT} = -50 μA | 3.0 | 2.99 | 2.9 | 2.9 | V | |
| | | | 4.5 | 4.49 | 4.4 | 4.4 | | |
| | | | 5.5 | 5.49 | 5.4 | 5.4 | | |
| | | V _{IN} = V _{IL} or V _{IH} | -12mA | 3.0 | | 2.56 | 2.46 | V |
| | | | I _{OH} -24mA | 4.5 | | 3.86 | 3.76 | |
| | | -24 mA | 5.5 | | 4.86 | 4.76 | | |

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| | | | | | | | |
|-----------------|----------------------------------|--|-----|-------|------|------|----|
| VOL | Maximum Low Level Output Voltage | I _{OUT} = 50 μA | 3.0 | 0.002 | 0.1 | 0.1 | V |
| | | | 4.5 | 0.001 | 0.1 | 0.1 | |
| | | V _{IN} = V _{IL} or V _{IH} | | | | | |
| | | I _{OH} 12mA | 3.0 | | 0.36 | 0.44 | V |
| | | I _{OH} 24mA | 4.5 | | 0.36 | 0.44 | |
| | | I _{OH} 24mA | 5.5 | | 0.36 | 0.44 | |
| I _{IN} | Maximum Input Leakage Current | V _{IN} = V _{CC} , GND | 5.5 | | ±0.1 | ±1.0 | μA |
| I _{OZ} | Maximum 3-State Current | V _{OE} = V _{IH} V _{IN} = V _{CC} or GND V _O = V _{CC} or GND | 5.5 | | ±0.6 | ±6.0 | μA |
| I _{CC} | Maximum Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | 8.0 | 80 | μA |

AC CHARACTERISTICS (*Voltage Range 3.3 V is 3.3 V ± 0.3 V; Voltage Range 5.0 V is 5.0 V ± 0.5 V)

| Symbol | Parameter (C _L = 50 pF) | V _{CC} (V) | AC651, AC652 | | | | Unit |
|------------------|---|---------------------|------------------------|------|---------------------------------|------|------|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | |
| | | | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay CBA or CAB to A _n or B _n | 3.0 | 4.0 | 17 | 3.0 | 19 | ns |
| | | 5.0 | 2.5 | 12 | 2.0 | 14 | |
| t _{PHL} | | 3.0 | 3.0 | 14.5 | 2.5 | 16.5 | ns |
| | | 5.0 | 2.0 | 10.5 | 1.5 | 12 | |
| t _{PLH} | Propagation Delay A or B to B _n or A _n | 3.0 | 3.0 | 14 | 2.5 | 16 | ns |
| | | 5.0 | 2.0 | 9.5 | 1.5 | 11 | |
| t _{PHL} | | 3.0 | 2.5 | 13 | 2.0 | 15 | ns |
| | | 5.0 | 1.5 | 9.0 | 1.0 | 10.5 | |
| t _{PLH} | Propagation Delay SBA or SAB to A _n or B _n | 3.0 | 3.0 | 14 | 2.5 | 16 | ns |
| | | 5.0 | 2.5 | 10 | 2.0 | 11.5 | |
| t _{PHL} | | 3.0 | 2.5 | 13.5 | 2.0 | 15.5 | ns |
| | | 5.0 | 2.0 | 10 | 1.5 | 11.5 | |
| t _{PZH} | Output Enable Time GBA to A _n | 3.0 | 2.5 | 12 | 2.0 | 13.5 | ns |
| | | 5.0 | 1.5 | 9.0 | 1.0 | 10 | |
| t _{PZL} | | 3.0 | 2.5 | 12 | 2.0 | 14 | ns |
| | | 5.0 | 1.5 | 9.0 | 1.0 | 10.5 | |
| t _{PHZ} | Output Disable Time GBA to A _n | 3.0 | 3.0 | 13 | 2.5 | 14 | ns |
| | | 5.0 | 2.0 | 11 | 1.5 | 12 | |
| t _{PLZ} | | 3.0 | 2.5 | 12.5 | 2.0 | 14 | ns |
| | | 5.0 | 2.0 | 10.5 | 1.5 | 12 | |
| t _s | Setup Time, Data to Clock | 5.0 | 7.0 | | 8.0 | | ns |
| t _h | Hold Time, Clock to Data | 5.0 | 2.5 | | 2.5 | | ns |
| t _w | Clock Pulse Width | 5.0 | 6.0 | | 7.0 | | ns |

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ACT — 651, 652

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | V _{CC} (V) | ACT651,652 | | | Unit |
|-----------------|----------------------------------|--|---------------------|------------------------|-------------------|-------------------------------|------|
| | | | | T _A = +25°C | | T _A = -40 to +85°C | |
| | | | | Typ | Guaranteed Limits | | |
| V _{IH} | Minimum High Level Input Voltage | V _{OUT} = 0.1V or V _{CC} - 0.1 V | 4.5 | 1.5 | 2.0 | 2.0 | V |
| | | | 5.5 | 1.5 | 2.0 | 2.0 | |

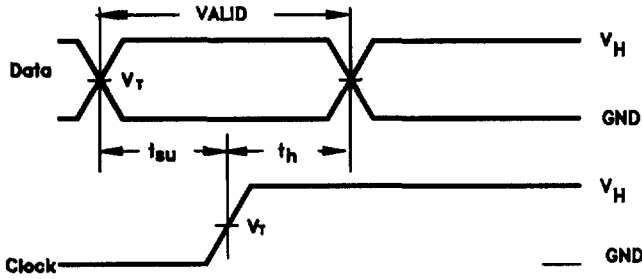
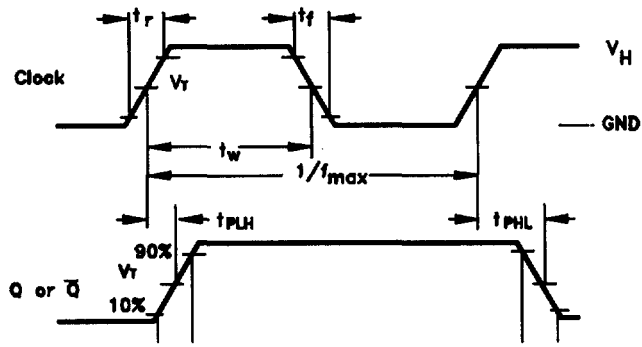
| Symbol | Parameter | Conditions | V _{CC} (V) | ACT651,652 | | | Unit |
|--------------------|---------------------------------------|--|------------------------|----------------|-------------------|----------------------|------|
| | | | | TA = +25°C | | TA = -40 to +85°C | |
| | | | | Typ | Guaranteed Limits | | |
| V _{IL} | Maximum Low Level Input Voltage | V _{OUT} = 0.1V or V _{CC} - 0.1 V | 4.5 5.5 | 1.5 1.5 | 0.8 0.8 | 0.8 0.8 | V |
| V _{OH} | Minimum High Level Output Voltage | I _{OUT} = -50 μA | 4.5 5.5 | 4.49 5.49 | 4.4 5.4 | 4.4 5.4 | V |
| | | V _{IN} = V _{IL} or V _{IH} I _{OH} = -24mA -24 mA | 4.5 5.5 | | 3.86 4.86 | 3.76 4.76 | V |
| V _{OL} | Maximum Low Level Output Voltage | I _{OUT} = 50 μA | 4.5 5.5 | 0.001 0.001 | 0.1 0.1 | 0.1 0.1 | V |
| | | V _{IN} = V _{IL} or V _{IH} I _{OL} = 24mA 24 mA | 4.5 5.5 | | 0.36 0.36 | 0.44 0.44 | V |
| I _{IN} | Maximum Input Leakage Current | V _{IN} = V _{CC} , GND | 5.5 | | ±0.1 | ±1.0 | μA |
| ΔI _{CC} T | Additional Max I _{CC} /Input | V _{IN} = V _{CC} - 2.1 V | 5.5 | 0.6 | | 1.5 | mA |
| I _{OZ} | Maximum 3-State Current | V _{OE} = V _{IH} V _{IN} = V _{CC} or GND V _O = V _{CC} or GND | 5.5 | | ±0.6 | ±6.0 | μA |
| I _{CC} | Maximum Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | 8.0 | 80 | μA |

AC CHARACTERISTICS

| Symbol | Parameter (C _L = 50 pF) | V _{CC} * (V) | ACT651, 652 | | | | Unit |
|------------------|--|--------------------------|-------------|------|------------------------|------|------|
| | | | TA = +25°C | | TA = -40°C to +85°C | | |
| | | | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay, CBA or CAB to A _n or B _n | 5.0 | 4.0 | 14.5 | 3.5 | 16.5 | ns |
| t _{PHL} | | | 3.5 | 14.5 | 3.0 | 16.5 | ns |
| t _{PLH} | Propagation Delay, A or B to B _n or A _n | 5.0 | 2.5 | 11.5 | 2.0 | 13 | ns |
| t _{PHL} | | | 2.5 | 11.5 | 2.0 | 133 | ns |
| t _{PLH} | Propagation Delay, SBA or SAB to A _n or B _n | 5.0 | 2.5 | 12 | 2.0 | 13.5 | ns |
| t _{PHL} | | | 3.0 | 12 | 2.5 | 13.5 | ns |
| t _{PZH} | Output Enable Time, GBA to A _n | 5.0 | 2.0 | 11.5 | 1.5 | 13 | ns |
| t _{PZL} | | | 2.5 | 11.5 | 2.0 | 13 | ns |
| t _{PHZ} | Output Disable Time, GBA to A _n | 5.0 | 3.0 | 13 | 2.5 | 14 | ns |
| t _{PLZ} | | | 2.5 | 12.5 | 2.0 | 14 | ns |
| t _{PZH} | Output Enable Time, GAB to B _n | 5.0 | 2.5 | 12 | 2.0 | 13.5 | ns |
| t _{PZL} | | | 2.5 | 12 | 2.0 | 13.5 | ns |
| t _{PHZ} | Output Disable Time, GAB to B _n | 5.0 | 3.5 | 13.5 | 3.0 | 14.5 | ns |
| t _{PLZ} | | | 3.0 | 13.5 | 2.5 | 15 | ns |
| t _s | Setup Time, HIGH or LOW A _n or B _n to CBA or CAB | 5.0 | 7.0 | | 8.0 | | ns |
| t _h | Hold Time, HIGH or LOW A _n or B _n to CPBA or CPAB | 5.0 | 2.5 | | 2.5 | | ns |
| t _w | CAB, CBA Pulse Width, HIGH or LOW | 5.0 | 6.0 | | 7.0 | | ns |

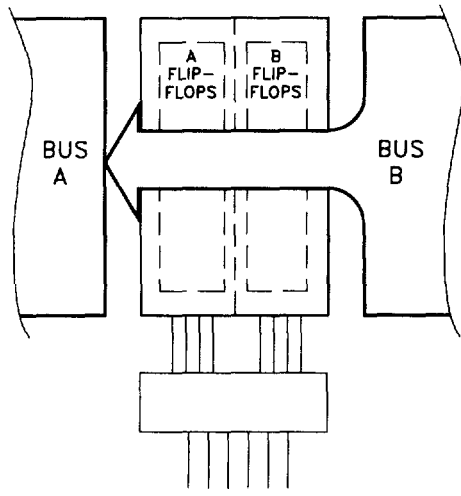
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SWITCHING WAVEFORMS



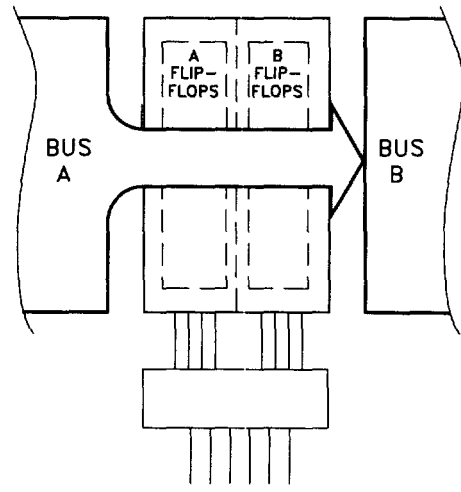
Input and output threshold voltage:
 $V_T = 50\% V_{CC}$ for AC; 1.5V for ACT
 $V_H = V_{CC}$ for AC, 3V for ACT

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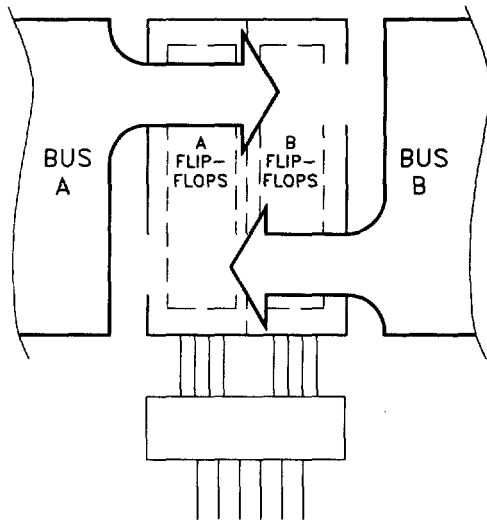
Real-Time Transfer
Bus B to Bus A

| Real-Time Transfer Bus B to Bus A | | | | | | |
|-----------------------------------|-------------------------|-----|-----|-----|-----|-----|
| Pin # | 21 | 3 | 1 | 23 | 2 | 22 |
| Function | $\overline{\text{GBA}}$ | GAB | CAB | CBA | SAB | SBA |
| Logic State | L | L | X | X | X | L |



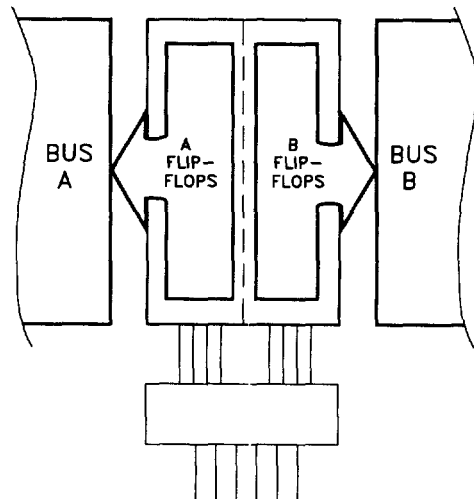
Real-Time Transfer
Bus A to Bus B

| Real-Time Transfer Bus A to Bus B | | | | | | |
|-----------------------------------|-------------------------|-----|-----|-----|-----|-----|
| Pin # | 21 | 3 | 1 | 23 | 2 | 22 |
| Function | $\overline{\text{GBA}}$ | GAB | CAB | CBA | SAB | SBA |
| Logic State | H | H | X | X | L | X |



Storage From
A, B, or A and B

| Storage From A, B or GAB | | | | | | |
|--------------------------|-------------------------|-----|-----|-----|-----|-----|
| Pin # | 21 | 3 | 1 | 23 | 2 | 22 |
| Function | $\overline{\text{GBA}}$ | GAB | CAB | CBA | SAB | SBA |
| Logic State | H | L | ↑ | ↑ | X | X |



Transfer Stored Data
To A or B

| Transfer Stored Data to A or B | | | | | | |
|--------------------------------|-------------------------|-----|-----|-----|-----|-----|
| Pin # | 21 | 3 | 1 | 23 | 2 | 22 |
| Function | $\overline{\text{GBA}}$ | GAB | CAB | CBA | SAB | SBA |
| Logic State | L | H | X | X | H | H |